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09/577,158	05/24/2000	Tsuyoshi Kowaka	192210US0	4954

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EXAMINER

WILSON, DONALD R

ART UNIT	PAPER NUMBER
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1713

60

DATE MAILED: 02/04/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/577,158

Applicant(s)

KOWAKA ET AL.

Examiner

D. R. Wilson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 26 June 2000.
- 2a) ☐ This action is FINAL.
- 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 29-54 is/are pending in the application.
- 4a) Of the above claim(s) 33-40, 43-45 and 52-54 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 29-32, 41, 42 and 46-51 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4,5,6.

- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

**DETAILED ACTION**

**Status of Application**

1. The Office Action of 12/5/01, Paper No. 7, did not take into account the preamendment filed 6/26/01, which hadn't yet been matched with the file. This supplemental action resets the time period for response. As previous Claims 1-28 have been cancelled the previous objections and rejections are withdrawn, but are applied as appropriate to the newly added claims as is set forth below.

2. The previous restriction requirement still applies to the previously set forth Groups I-IV. Applicants election of the inventions of Group I, now claims 29-32, 38-44 and 46-51 remains in effect. The grouping of the new claims is as follows:

- I. Claims 29-32, 38-44 and 46-51, drawn to a method of preparing polyvinyl alcohol (PVOH), classified in class 525, subclass 62.
- II. Claims 33-37 and 45, drawn to a two stage method of preparing PVOH, classified in class 525, subclass 62.
- III. Claim 52, drawn to a method of making a PVOH fiber, classified in class 525, subclass 56.
- IV. Claim 53-54, drawn to PVOH, classified in class 264, subclass 176.1+.

Claims 33-37, 45 and 52-54 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention. Affirmation of this election must still be made by applicant in replying to this Office action.

3. Applicant's previous election of the species of (a) a mixture of dimethyl sulfoxide and methanol as the alcohol containing solvent, and (b) sodium methoxide as the saponification catalyst also remains in effect. In light of the new claims an election of species of the type of reactor was also made. During a telephone conversation with Mr. Harris Pitlick on 1/14/02 a provisional election was made with traverse to prosecute the invention of the specie of a shell & tube heat exchanging reactor as set forth in Claim 42. Affirmation of this election must be made by applicant in replying to this Office action. Claims 38-40 and 43-44 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected specie of the invention.

**Previously Cited Statutes**

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

**Claim Rejections - 35 USC § 112, Second Paragraph**

5. Claims 41 and 46 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
6. Claim 41 is indefinite because of the word "type". When appended to an otherwise definite expression, "type" so extends the scope of the expression as to render it objectionably indefinite. *Ex parte* Copenhagen, 109 USPQ 118. It is suggested that the word "type" be deleted from the claim. (A similar issue exists for claims to non-elected species of the invention.

7. Claim 46 is indefinite because a limiting (or intrinsic) viscosity is indefinite unless both the temperature and solvent of measurement are known. The specification only appears to teach the temperature of measurement.

**Claim Rejections - 35 USC § 103**

8. Claims 29-32 and 46-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP'807 or Sato, each in view of Morrison or Yanai. The citations to JP'807 below are to the PTO English translation of JP'807.

9. JP'807 discloses saponification of a polyvinyl ester such as polyvinyl acetate (PVAc) having a viscosity of at least 1.4 dl/g, in a solvent among which dimethyl sulfoxide (DMSO) is specified, or in admixture with methanol (pages 6-7). The presence of a saponification catalyst including alcoholates of alkali metals, of which sodium methoxide would have been an obvious example, is also taught (page 8, 2<sup>nd</sup> paragraph). Example 1 exemplifies a saponification of 20 pbw of PVAc in a mixture of 180 pbw of DMSO and 37 pbw of methanol (9.2 wt.% PVAc). The ratio of moles of alcohol with respect to polyvinyl alcohol are within the limits of instant Claim 51. Example 2 exemplifies saponification of a 180 pbw of a 22 wt.% solution of PVAc in methanol admixed with 178 pbw of dimethylformamide (11.1 wt.% PVAc).

$\text{CH}_2\text{CH}(\text{CO}_2\text{CH}_3)$   
 40

$\text{O}-\text{C}-\text{CH}_2$   
 58

$\frac{37}{31} =$

73.8  
 40

JP'807 is deficient in not disclosing that the saponification reaction is carried out while distilling off the carboxylic acid ester reaction product.

10. Sato discloses processes for producing polyvinyl alcohols (PVOHs) containing various functional groups, which includes a hydrolysis step of the precursor polyvinyl ester. It is specifically disclosed that "[a]ny ordinary hydrolysis of polyvinyl esters that uses a basic or acid catalyst may apply to the present invention." An example of said hydrolysis includes using sodium methylate (methoxide) as the basic catalyst, an alcoholic solvent such as methanol, and in order to improve solubility of the vinyl ester, the presence of an appropriate solvent among which DMSO is specifically named (col. 5, lines 19-37). Vinyl acetate polymers are preferred as is evidenced by the examples. Thus, Sato discloses that the hydrolysis of PVAc in solvents such as a mixture of DMSO and methanol with sodium methylate catalyst is ordinary, but is deficient in not disclosing that the saponification reaction is carried out while distilling off the carboxylic acid ester reaction product. The viscosity of the vinyl ester polymers which can be used include those within the limits of instant Claim 46, e.g., viscosity average molecular weights of  $365 \times 10^3$  and higher (see col.2, lines 54-62). A number of the Examples in Table 4 exemplify hydrolysis conditions wherein the ratio of moles of alcohol with respect to polyvinyl alcohol are within the limits of instant Claim 51. 50-11-012

11. It is a well established that transesterification reactions are equilibrium reactions, and that in order "--- to shift the equilibrium to the right, it is necessary to use a large excess of the alcohol whose ester we wish to make, or else to remove one of the products from the reaction mixture" (Morrison pp 682-683). Morrison also teaches in the same place that the second approach is the better one when feasible, since in this way the reaction can be driven to completion. Yanai makes a similar disclosure in a process of saponifying ethylene-vinyl acetate copolymers in mixtures of DMSO and methanol. It is taught that "--- for the purpose of increasing the saponification degree to shift the saponification equilibrium to the formed product side", and that "[f]or this reason it is desired to efficiently distill off the ester used, e.g., methyl acetate" (col. 10, lines 11-32). It would have been obvious to one of ordinary skill in the art in the saponification process taught by JP'807 or Sato, to distill off the methyl acetate formed, such as is taught by either Morrison or Yanai, in order to efficiently increase the degree of saponification,

and/or to reduce the amount of alcohol required to achieve high degrees of saponification. It would also have been obvious to commence distillation after an equilibrium is approached, i.e., after the methyl acetate had formed. Degrees of saponification in the primary saponification reaction such as are claimed would be expected to be below said equilibrium value.

12. Although JP'807 doesn't appear to teach reactions wherein the concentration of the polyvinyl alcohol polymer is 10 wt.% or more, some degree of latitude in what has been exemplified. Further, it would have been obvious to one of ordinary skill in the art to minimize the amount of solvent used in order to decrease the costs associated with recovering solvents. Sato exemplifies hydrolysis reactions in the examples wherein the concentration of the functionalized vinyl acetate polymer is above 10 wt.% PVOH. As the hydrolysis reaction has been equated to the ordinary hydrolysis of PVAc, it would have been obvious to one of ordinary skill in the art that such concentration are known to be used in the hydrolysis reactions disclosed for PVAc.

13. **Claims 29-32 and 47-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imai in view of Morrison and Yanai, optionally in view of Examiner's Notice.**

14. Imai discloses an improved process for producing PVOH from PVAc by reaction in an organic sulfoxide solvent (col. 1, lines 60-68). The reactions disclosed include base catalyzed alcoholysis by methanol in a dimethyl sulfoxide solution of polyvinyl acetate (col. 3, lines 49-69, and Examples 3-5). However, Imai uses a large excess of solvent and is deficient in not disclosing that the saponification reaction is carried out while distilling off the carboxylic acid ester reaction product. The teachings of Morrison and Yanai are discussed above. It would have been obvious to one of ordinary skill in the art in the saponification process taught by Imai, to use a higher concentration of PVAc in the alcoholysis reaction and to distill off the methyl acetate formed, such as is taught by either Morrison or Yanai, in order to efficiently increase the degree of saponification, and to avoid the high cost of handling large quantities of solvent. Such higher concentrations of PVAc would have been expected to include ratios within the limits of instant Claim 51. It would also have been obvious to commence distillation after an equilibrium is approached, i.e., after the methyl acetate had formed. Degrees of saponification in the primary saponification reaction such as are claimed would be expected to be below said equilibrium value. Imai is

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deficient in not disclosing the elected specie of sodium methoxide as the basic catalyst. However, it would be inherent that at least some minimal quantity of sodium methoxide would be present in equilibrium with the sodium hydroxide catalyst used. Alternatively, the Examiner takes Notice that the use of sodium methoxide as the basic catalyst in the alcoholysis of PVAc with methanol is well known and would have been obvious to use with the expectation of equivalent results.

15. **Claims 41-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over:**

a. **JP'807 or Sato, each in view of Morrison or Yanai as applied to Claims 29-32 and 46-51 above, or**

b. **Imai in view of Morrison and Yanai, optionally in view of Examiner's Notice as applied to Claims 29-32 and 47-51 above;**

**and further in view of Standiford, K**

16. The above stated prior art rejections are deficient in not teaching carrying out the saponification reaction in a shell and tube evaporator. First it is noted that shell and tube evaporators are the most widely used type of film evaporator used, among which one version is the falling film type (Standiford, pp. 965-968). Secondly, it is well known in the field of polymer technology to employ film type evaporators in order to remove volatiles and/or to shift the equilibrium in condensation reactions. For example, in the preparation of polyesters it is known to remove ethylene glycol under reduced pressure in order to advance the degree of polymerization, i.e., shifting the equilibrium to the formation of polymer (King, col. 7, line 63 to col. 8, line 14). Example 6 exemplifies the use of a falling film evaporator for removing the ethylene glycol to complete the polymerization. Similarly, in the synthesis of polycarbonate by the transesterification of a dihydroxy compound and a diester carbonate, a thin film evaporator is used to remove the by product alcohol and advance the degree of polymerization (Ishiwa, col. 14, lines 31-42). It would have been obvious to one of ordinary skill in the art to use a shell and tube type evaporator for the removal of volatile methyl acetate in order to increase the degree of saponification in the processes taught by (a) JP'807 or Sato, each in view of Morrison or Yanai, or (b) Imai in view of Morrison and Yanai, optionally in view of Examiner's Notice, as film type evaporators are well known to be used in the field of polymer technology for removing volatiles in order to shift the equilibrium in ester forming reactions as for

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instance is taught by King and Ishiwa, and because shell and tube type reactors are well known and commonly used film type evaporators as for instance is disclosed by Standiford.

***Art of Interest/Technological Background***

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kamachi discloses the preparation of non-elected species of the invention in DMSO/methanol solvent and may be used as a basis of future obviousness rejections.

***Future Correspondence***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to D. R. Wilson whose telephone number is 703-308-2398.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 703-308-2450. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-5408 for regular communications and 703-305-3599 for After Final communications. The unofficial direct fax phone number to the Examiner's desk is 703-872-9029.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 308-2351.



D. R. Wilson  
Primary Examiner  
Art Unit 1713